

## CLAIMS

1       1. In an intermediate network device having at least one line card defining a plu-  
2       rality of ports for receiving and forwarding messages and two or more supervisors, each  
3       supervisor configured to run one or more applications to facilitate message handling by  
4       the network device, a method for continuing operation of at least one application despite  
5       crashes or failures, the method comprising the steps of:

6             designating a first supervisor to be an active supervisor and a second supervisor to  
7       be a standby supervisor for the network device;

8             executing the at least one application at the active supervisor;

9             holding the at least one application at the standby supervisor in a dormant state;

10            transmitting state information generated during execution of the at least one ap-  
11       plication from the active supervisor to the standby supervisor;

12            storing the state information at the standby supervisor; and

13            in response to a failure at the active supervisor, carrying on execution of the at  
14       least one application at the standby supervisor based upon at least some of the stored state  
15       information.

1             2. The method of claim 1 further comprising the step of defining a synchroniza-  
2       tion database having one or more synchronization records at the active supervisor,  
3       wherein

4             the synchronization records store state information to be transmitted to the  
5       standby supervisor.

1             3. The method of claim 2 further comprising the step of updating one or more of  
2       the synchronization records in response to an operating change at the at least one appli-  
3       cation program.

1             4. The method of claim 3 wherein the transmitting step comprises the step of  
2       sending the one or more updated synchronization records to the standby supervisor.

1           5. The method of claim 1 further comprising the steps of:  
2           generating a sequence number for use in instructing the at least one line card to  
3           change operating condition;  
4           sending the sequence number to the at least one line card with the instruction; and  
5           storing the sequence number at the at least one line card.

1           6. The method of claim 5 further comprising the steps of:  
2           sending the sequence number to the standby supervisor;  
3           storing the sequence number at the standby supervisor; and  
4           in response to a failure of the active supervisor, comparing the sequence number  
5           stored at the standby supervisor with the sequence number at the at least one line card.

1           7. The method of claim 6 further comprising the step of continuing operation of  
2           the at least one line card, following a crash or failure of the active supervisor, if the se-  
3           quence number stored at the at least one line card is one of (a) less than or equal to or (b)  
4           greater than the sequence number stored at the standby supervisor.

1           8. The method of claim 7 further comprising the step of resetting the at least one  
2           line card, following a crash or failure of the active supervisor, if the sequence number  
3           stored at the at least one line card is one of (a) greater than or (b) less than or equal to the  
4           sequence number stored at the standby supervisor.

1           9. The method of claim 1 further comprising the steps of:  
2           determining the validity of the state information stored at the standby supervisor  
3           following a crash or failure of the active supervisor; and  
4           blocking the at least one application from utilizing state information determined  
5           to be invalid in its execution.

1           10. The method of claim 1 further comprising the steps of:  
2           creating, at the active supervisor, an instance of an event in response to a request  
3           from an application;

1 11. The method of claim 10 further comprising the step of:  
2 in response to a crash or failure of the active supervisor, determining whether one  
3 or more event instances passed to the standby supervisor remain open;  
4 for a given event instance that remains open, identifying the requesting and lis-  
5 tening applications that have not completed their processing of the given event instance;  
6 for each requesting and listening application that has not completed its processing  
7 of the given event instance, calling a recovery function defined by the respective applica-  
8 tion to handle the open event instance.

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13 a database mechanism for storing the state variables at the first and second  
14 supervisor cards.

1 13. The network device of claim 12 wherein:  
2 the first supervisor card is designated as an active supervisor card and the second  
3 supervisor card is designated as a standby supervisor card;  
4 the application is allowed to run on the active supervisor card but not on the  
5 standby supervisor card; and  
6 in response to a crash or failure of the active supervisor card, the application car-  
7 ries on its execution from the standby supervisor card utilizing at least some of the state  
8 variables stored at the database mechanism of the standby supervisor card.

1 14. The network device of claim 12 further comprising at least one line card de-  
2 fining a plurality of ports for forwarding messages across the computer network, the at  
3 least one line card in communicating relationship with the first and second supervisor  
4 cards and configured to receive and maintain port state information from the application,  
5 wherein

6 the high availability entities at the first and second supervisor cards further com-  
7 prise:

8 a sequence mechanism for ensuring that the state variables stored at the  
9 first and second supervisor cards are consistent with the port state information  
10 maintained at the at least one line card.